

# Chapter 2, Limits and Continuity Notes

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## 1 Limits

**Definition 1.1.** Let  $f$  be a real-valued function. We say that the **limit** of  $f(x)$  as  $x$  approaches  $a$  is  $L$ , or

$$\lim_{x \rightarrow a} f(x)$$

if, for all  $\epsilon > 0$ , there exists  $\delta > 0$  such that if  $x$  is within  $\delta$  of  $a$  (with  $x \neq a$ ), then  $f(x)$  is within  $\epsilon$  of  $L$ . We write this more precisely as

$$0 < |x - a| < \delta \Rightarrow |f(x) - L| < \epsilon$$

,

where the " $\Rightarrow$ " symbol means "implies":

$$\text{If } 0 < |x - a| < \delta, \text{ then } |f(x) - L| < \epsilon.$$